

## BOTRYOSPHAERIA ON COTTON BOLLS

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Among the fungi of minor importance on cotton bolls in the southern states is a pyrenomycete which has been provisionally referred to *Botryosphaeria fuliginosa* (Mongeot & Nestler) Ellis & Ev. This fungus is not common on cotton but is occasionally picked up. The first collection on this host seems to have been made by Atkinson in Alabama some years ago. Atkinson's material was sent to Masee and was determined by him as *Botryosphaeria Berengeriana* De Not.<sup>1</sup> But as Ellis and Everhart list this name as a synonym of *Botryosphaeria fuliginosa*, the latter name will be used in this article. It is probable that this name is not the correct one, but the question of nomenclature will not now be considered. Atkinson's material has also been examined by the writer and found to be identical with material collected by him.

Having found this pyrenomycete on cotton bolls in Louisiana, a study of its life history was commenced in order to see if it had any connection with any of the imperfect fungi which are instrumental in causing boll rots. On account of the somewhat similar appearance of the boll affected by the *Botryosphaeria*, to one affected by *Diplodia gossypina*, it was thought that there might be some connection between the two. This seemed all the more possible because Shear had reported *Sphaeropsis* and *Diplodia* forms as connected with *Botryosphaeria*.<sup>2</sup> However, this was not found to be the case. While the *Botryosphaeria* on cotton bolls has an imperfect form in its life history, it is quite distinct from *Diplodia gossypina*.

Two stages of the fungus have been found, a pycnidial stage belonging to the form genus *Macrophoma*, and the perfect or

<sup>1</sup> Atkinson, G. F., Some fungi from Alabama, Bull. Cornell University, 3: 11. 1897.

<sup>2</sup> Shear, C. L., Life History of *Melanops Quercuum* (Schw.) Rehm forma *Vitis* Sacc. (abstract), Science, n. s. 31: 748. 1910.

ascogenous stage. The pycnidial stage occurs during the summer and is followed by the ascogenous stage in the fall. A boll affected by this fungus turns black, dries up, and becomes covered with the fruiting stages.

The pycnidia develop profusely on the surface of the diseased boll, usually almost superficial, though sometimes they may have the base slightly surrounded by fungous or host tissue. They are black in color and about  $110-300 \times 140-210 \mu$  in size. The spores are developed abundantly on short conidiophores and are pushed out of the pore at the apex of the pycnidium. If weather conditions are favorable, these spores remain in white strings protruding from the pycnidia. The spores are hyaline, one-celled, from cylindrical to slightly ellipsoid or ovoid, coarsely granular, and  $14-33 \times 7-10 \mu$  in size, averaging about  $21-25 \times 8 \mu$ . The spores are never septate nor dark-colored and are much more variable in shape and size than those of *Diplodia gossypina*.

The perithecia are borne in a way similar to the pycnidia and are quite similar in appearance. They are black in color and are about  $190-360 \times 250-320 \mu$  in size. A short beak may be present or lacking; if present, it may have a length up to  $100 \mu$ . The asci are fairly abundant in the perithecia, though not crowded. They are large, about  $100-130 \times 20-25 \mu$ , and have very thick walls, especially near the apex. The ascospores are hyaline, ellipsoid, slightly granular, and about  $20-27 \times 10-16 \mu$  in size. The small threadlike paraphyses are very abundant.

The fungus has been cultured a number of times both from the conidia and the ascospores. A good growth develops on most of the ordinary culture media but as yet no spores of any kind have been produced in culture media.

To prove the identity of the two forms, inoculation experiments were tried. In the winter of 1909-10, a pure culture was obtained from conidia, and this was used during the summer of 1910 to inoculate a number of bolls in the field. The fungus is not a very active parasite under field conditions, so only a part of the bolls became affected. These, however, on which the inoculation was successful, developed the pycnidia abundantly and later in the season some of them developed perithecia and ascospores. Single asci were then transferred to acidified culture

media in plates and pure cultures were again obtained. In the winter of 1910-11, these cultures from ascospores were used to inoculate cotton bolls on plants in the greenhouse. These bolls became affected and developed the pycnidia and conidia. Other inoculations made direct from bolls covered with the pycnidial stage have developed the perithecial stage later in the season. As a result of these inoculations, the identity of the two stages is proven.

From this study, it seems questionable whether the *Botryosphaeria* that we have on cotton bolls in the south is really the same as the one that is so common on a large number of woody plants in all parts of the country. In a paper read before the American Association for the Advancement of Science in December, 1909, Shear produced evidence to show that the common form of *Botryosphaeria fuliginosa* is connected with a pycnidial stage with spores usually colored and sometimes septate, a stage that could belong to either *Sphaeropsis* or *Diplodia*. As the *Botryosphaeria* which we have on cotton bolls in the south is not connected with a *Diplodia*, it would look as if the cotton *Botryosphaeria* is specifically distinct from the common form.

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